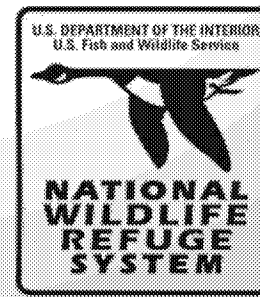
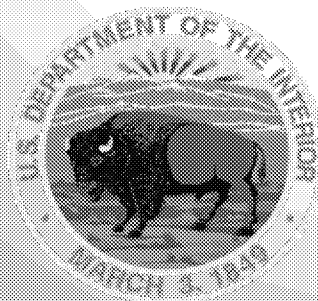
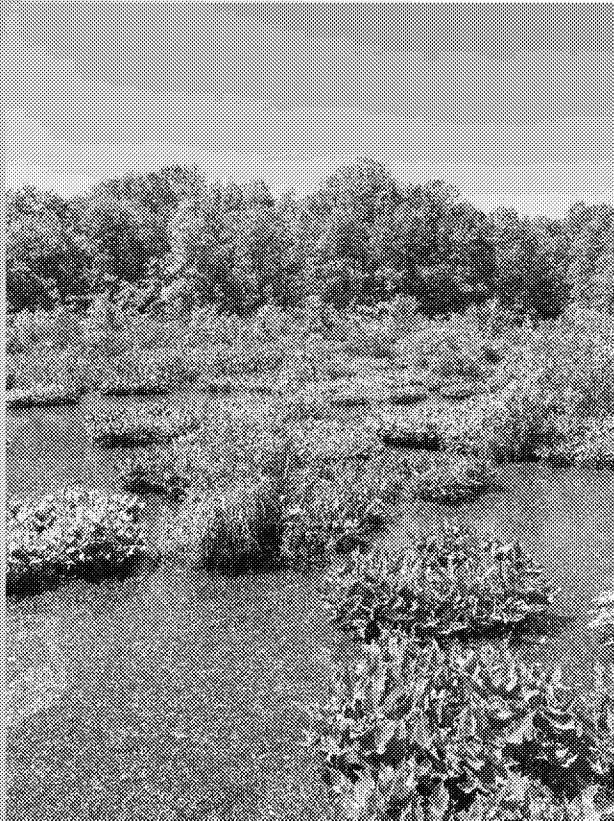


Refuge Scoping Considerations

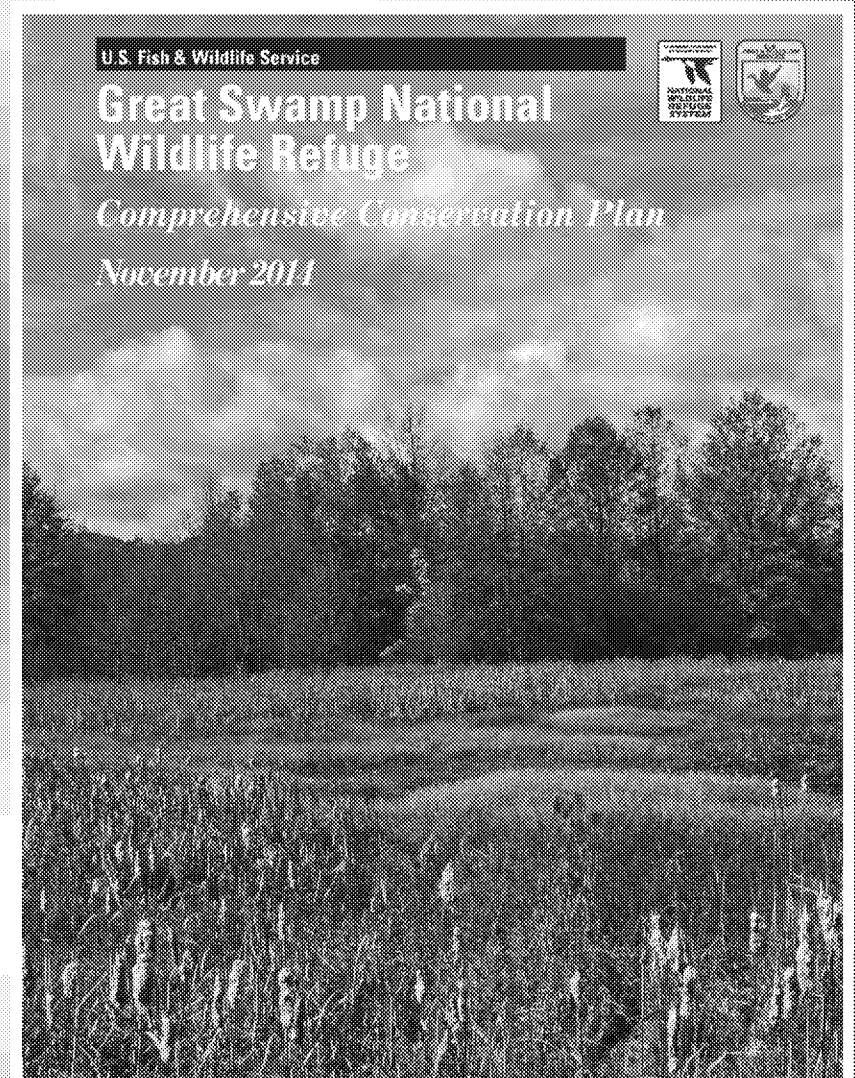
Rolling Knolls Landfill Remediation



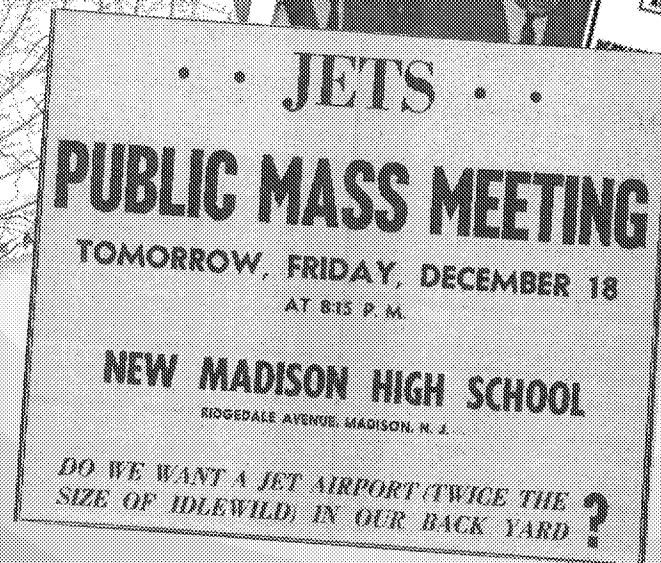
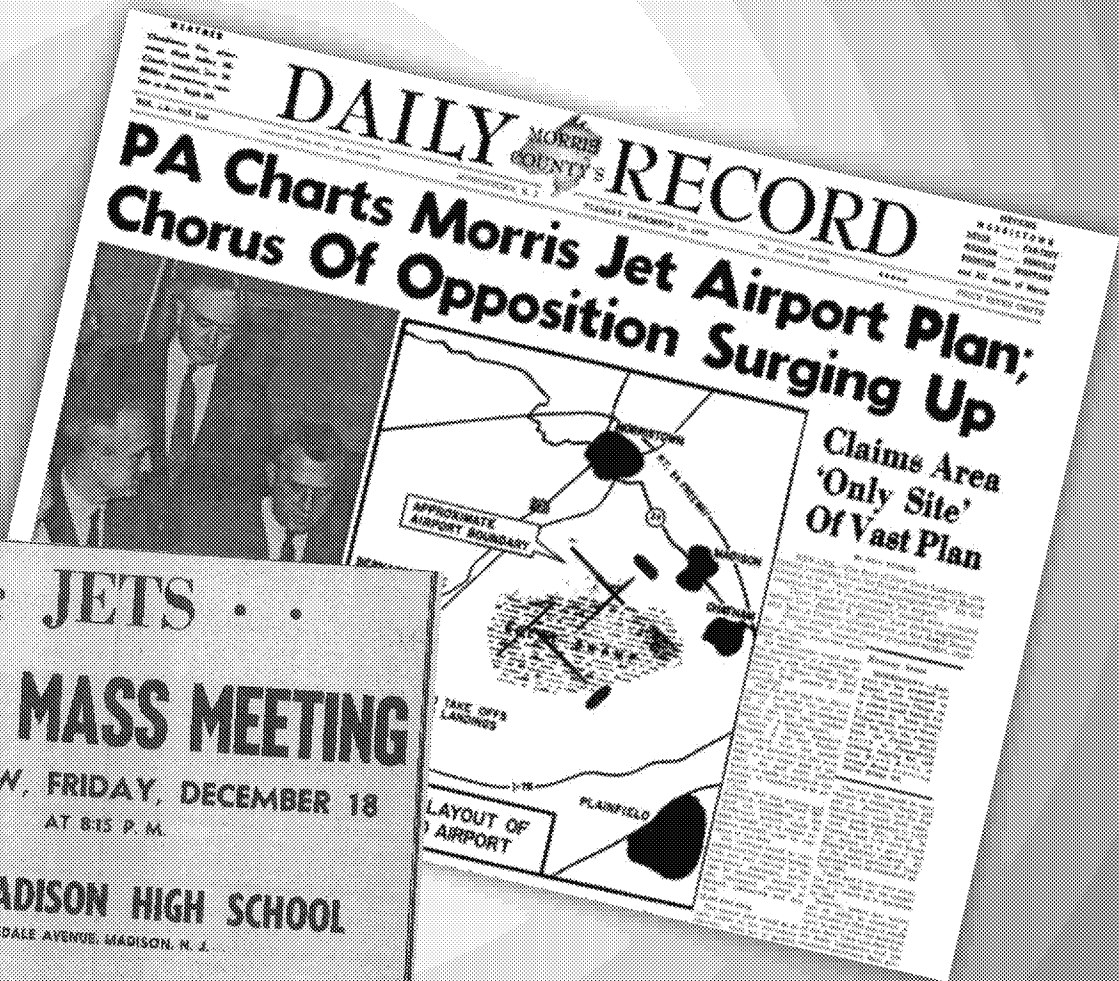
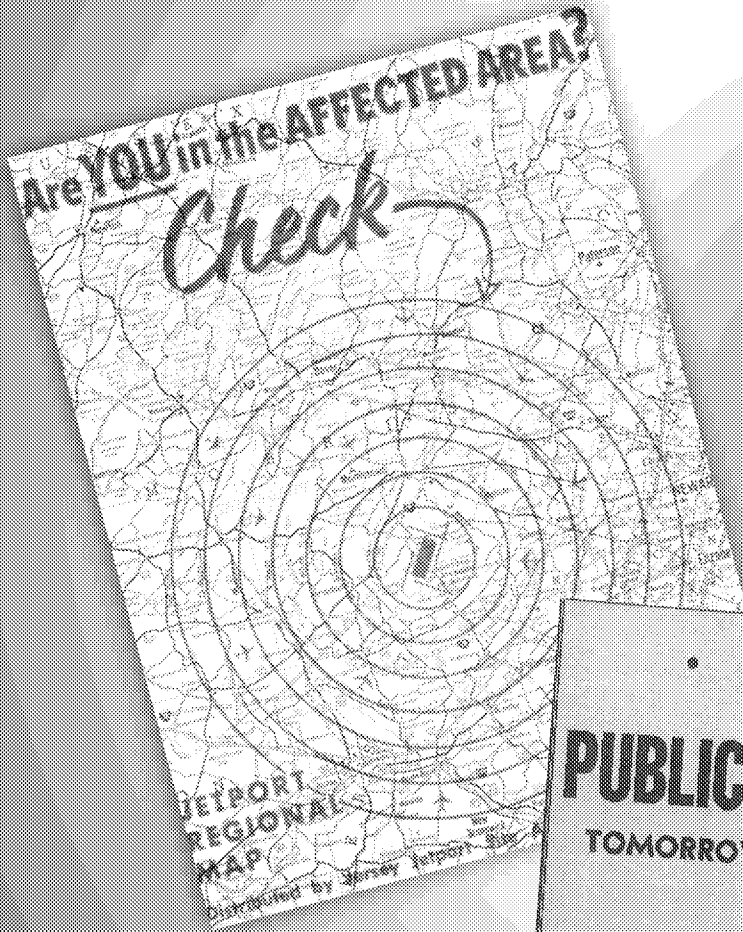
FWS Scoping Process

Rolling Knolls Landfill

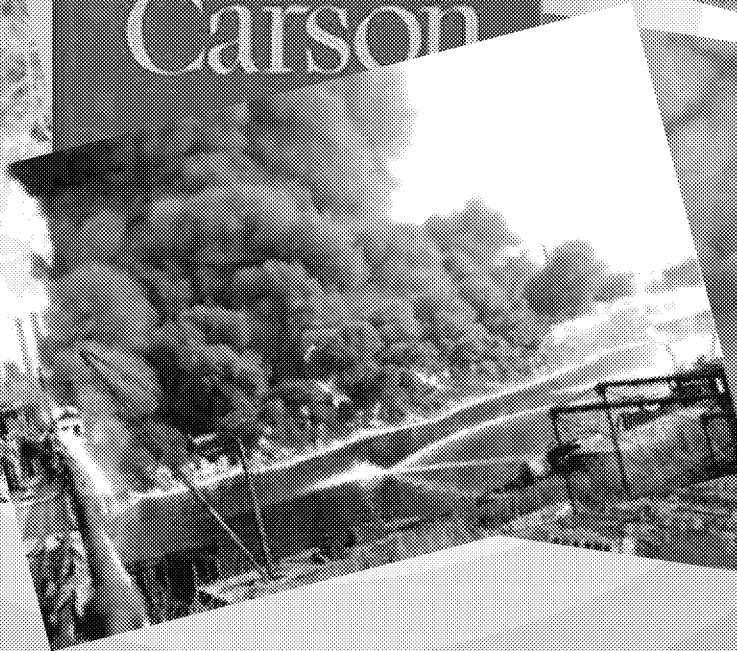
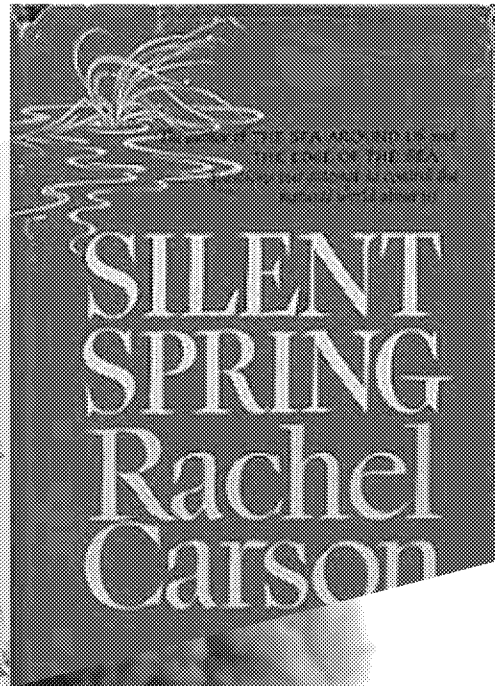
- Access to the Refuge portion of the site
- Remedy must be compatible with Refuge management obligations which are applicable or relevant appropriate requirements (ARARs)
- Condition access on appropriate measures to ensure protection of refuge wildlife and visitors



The Jetport and establishment of Great Swamp NWR



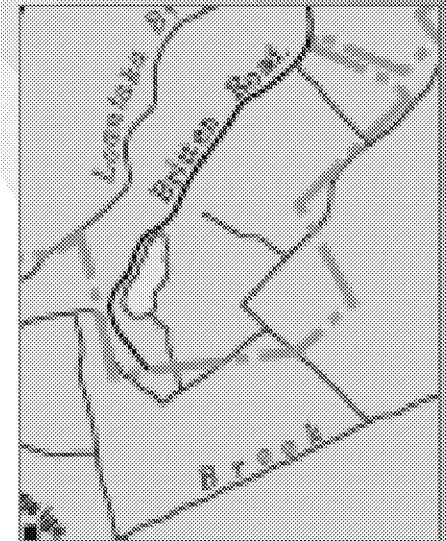
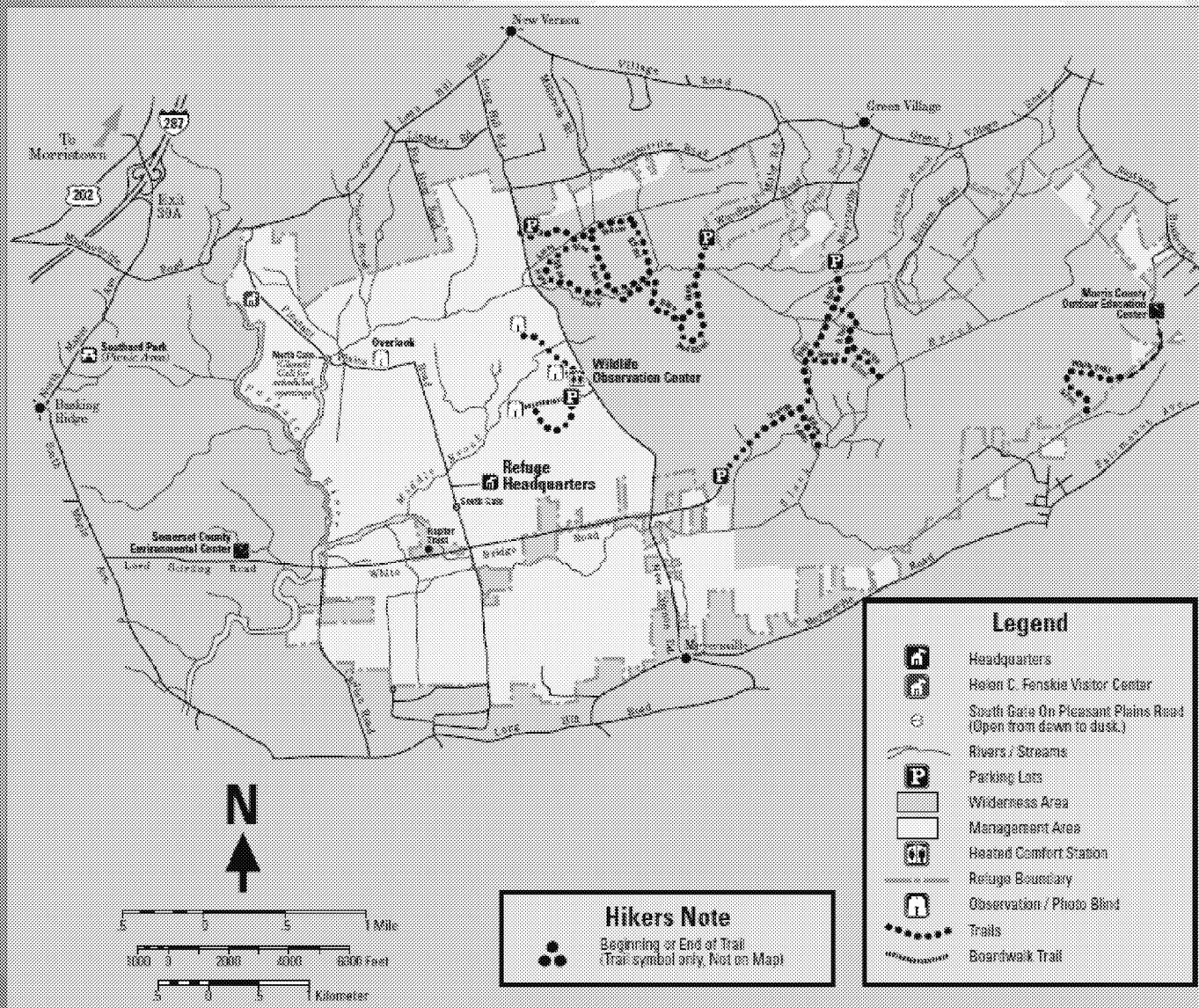
Environmental Movement and Laws



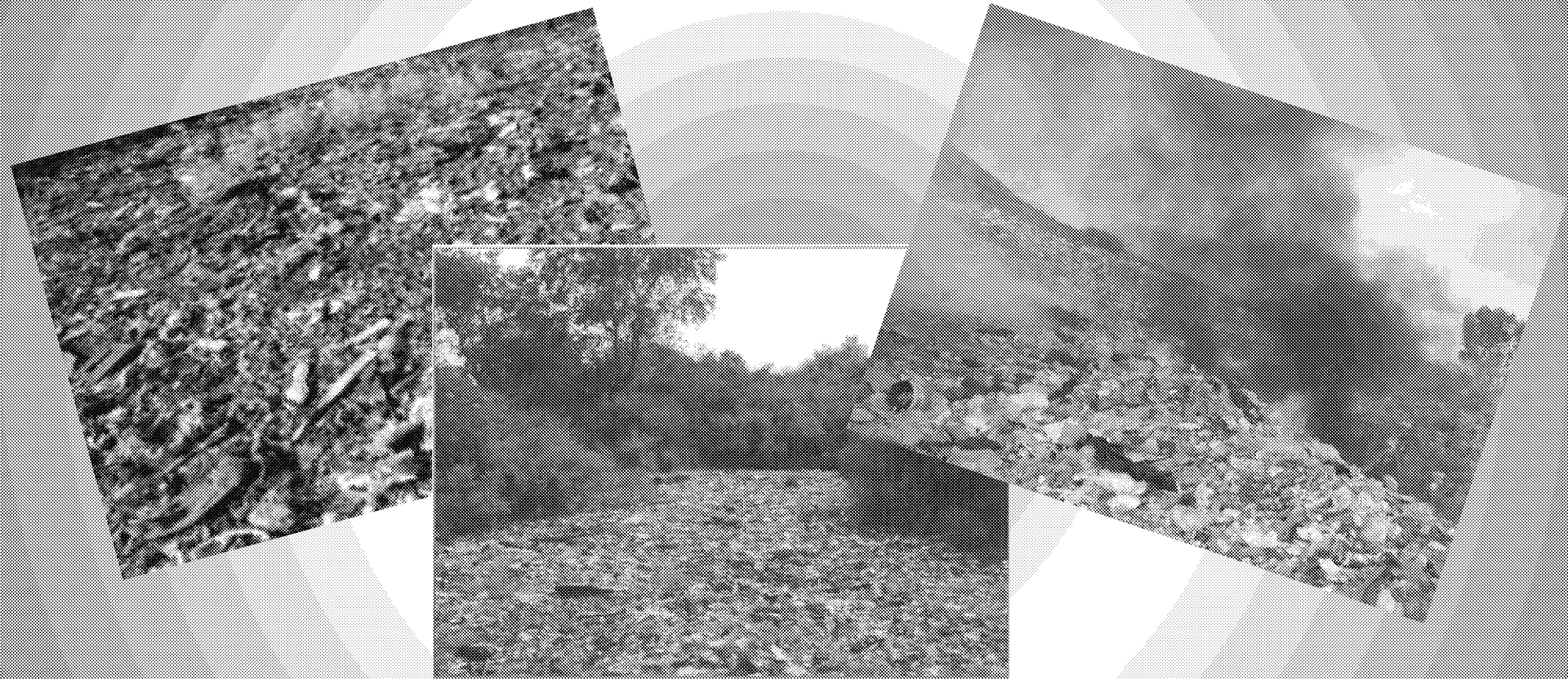
Wilderness Act of 1964 and Designation of Great Swamp Wilderness in 1968



Great Swamp NWR today



So yes, this land is special.....even though it
has its own set of challenges



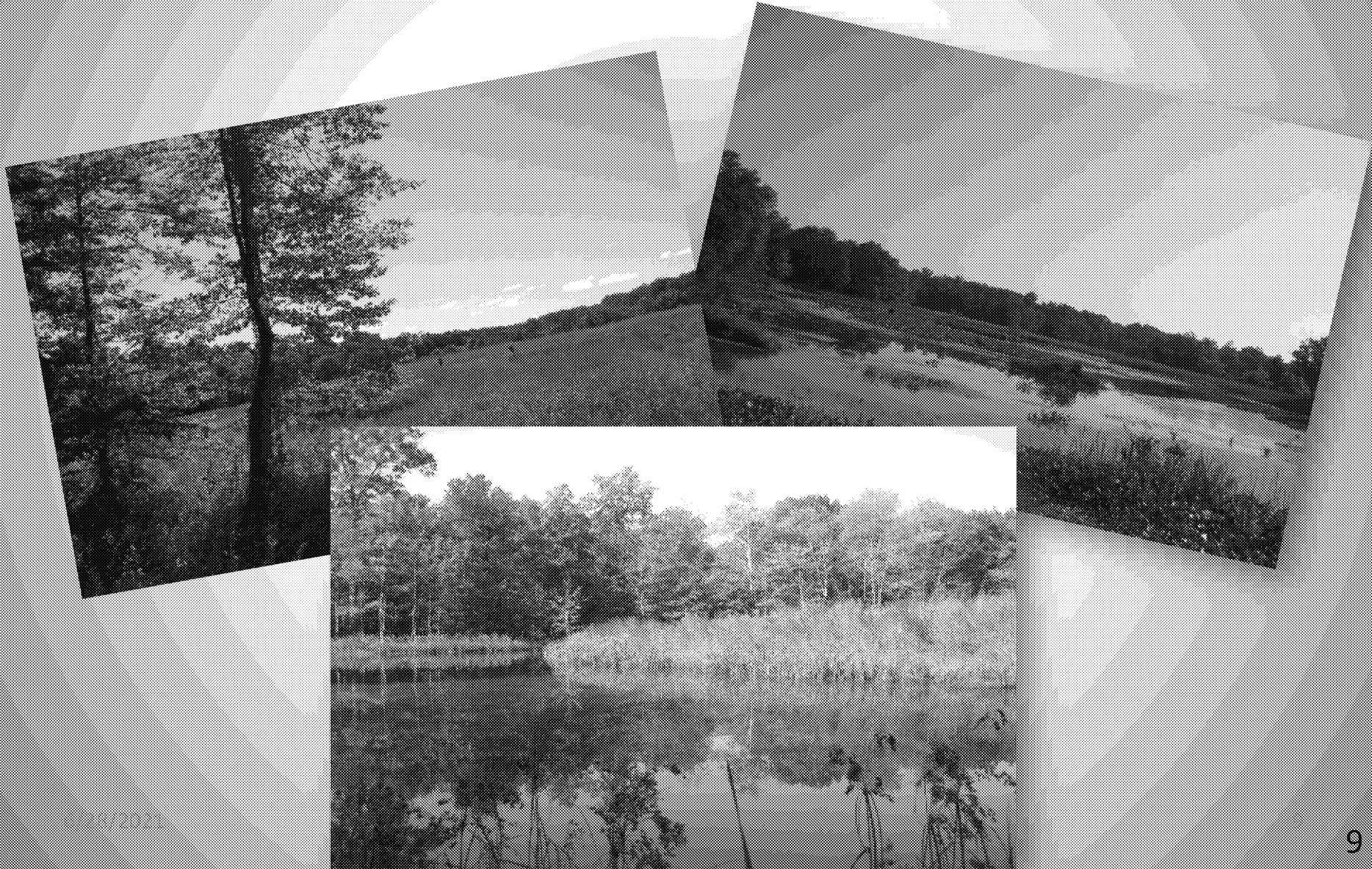
All remaining open land in Chatham Township
deserves careful consideration

FWS clean up of Wilderness Area Dump



6/26/2021

FWS remediation of other Refuge waste sites



6/26/2021

CERCLA Remediation at Rolling Knolls Landfill

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) enactment/amendment (1980/1986) provided new avenue for cleaning up the Rolling Knolls Landfill
- EPA Preliminary Assessment/Site Investigation (1986 -2000)
- FWS Sponsored Preliminary Investigations (1988, 1989, 1999)
- EPA Hazard Ranking/National Priority List (2003) **based on impacts to Refuge and potential for ecological impacts**

CERCLA Remediation at Rolling Knolls Landfill

- Group of potentially responsible parties (PRPs) agreed to conduct remedial investigation/feasibility study (RI/FS) (2005)
- FWS/PRP Group RI/FS Access Agreement (2007)
- FWS advocates for and gets \$600,000 from the Department of Justice to support PRP Group's RI/FS work (2010)
- FWS met with PRP Group and EPA to discuss various topics including Refuge RI/FS needs, remedial ideas including use of on-site material for capping, and future potential for public use (2014-2018)

CERCLA Remediation at Rolling Knolls Landfill

- FWS has ongoing discussions with the Miele Trust regarding various landfill issues including future use (1999-present)
- FWS identified RI/FS data gaps/alternative deficiencies (2018-present)
- FWS participates in community advisory group (CAG) meetings (2018-present)
- EPA sends FWS a General Notice of Liability notifying FWS that it was considered a PRP at the site (2020)

CERCLA Remediation at Rolling Knolls Landfill-Data Gaps

During a review of remedial options being considered, it became clear the protective measures that had been discussed with all parties involved since 2014 had not been included in the FS or subsequent revisions.

Based on this, the need for additional data became apparent.

- Spatial gaps in surface soil and sediment sampling on refuge
- Limited sub-surface samples in waste pile
- Interface between waste, surface water, shallow groundwater and sediment not understood.

CERCLA Remediation at Rolling Knolls Landfill

FWS supplemental
investigation (2020-present)
– total estimated cost:
\$750,000

Field collection of additional
soil, sediment, surface water,
pore water (to address data
gaps) and geotechnical
samples (to verify clay layer)
on Refuge portion of the site
complete



CERCLA Remediation at Rolling Knolls Landfill

- Surface and subsurface soil samples from approximately 30 locations
- Approximately 50 pore water samples
- Approximately 20 sediment samples
- Approximately 10 surface water samples



CERCLA Remediation at Rolling Knolls Landfill

- Field work completed early June 2021
- Final report to be available in September
- FWS expects this additional data to be valuable in evaluating remedial alternatives



Refuge Compatibility and Future Use Issues

Evidence of widespread hazardous substances –
mixed municipal and industrial waste throughout

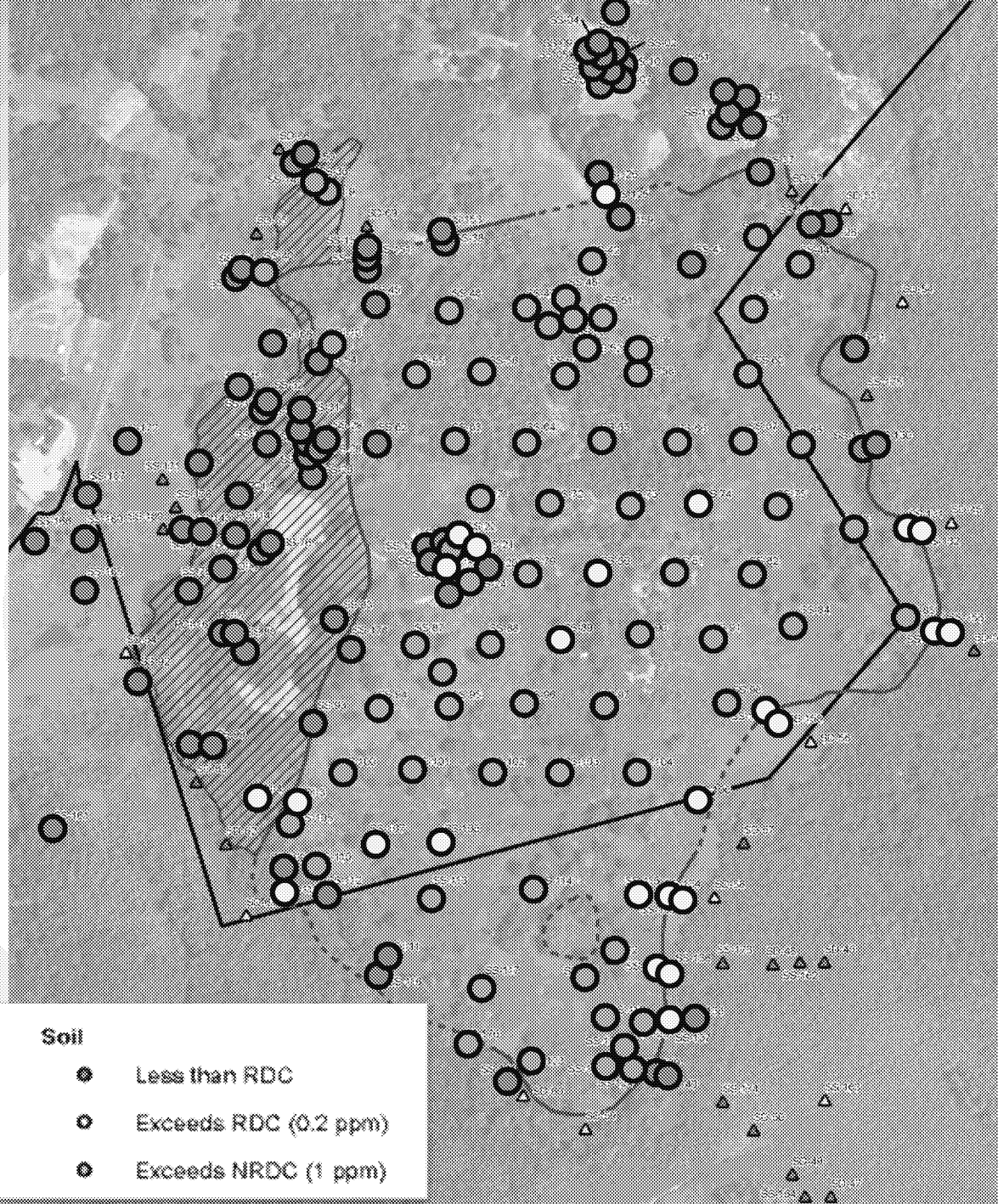


Refuge Compatibility and Future Use Issues

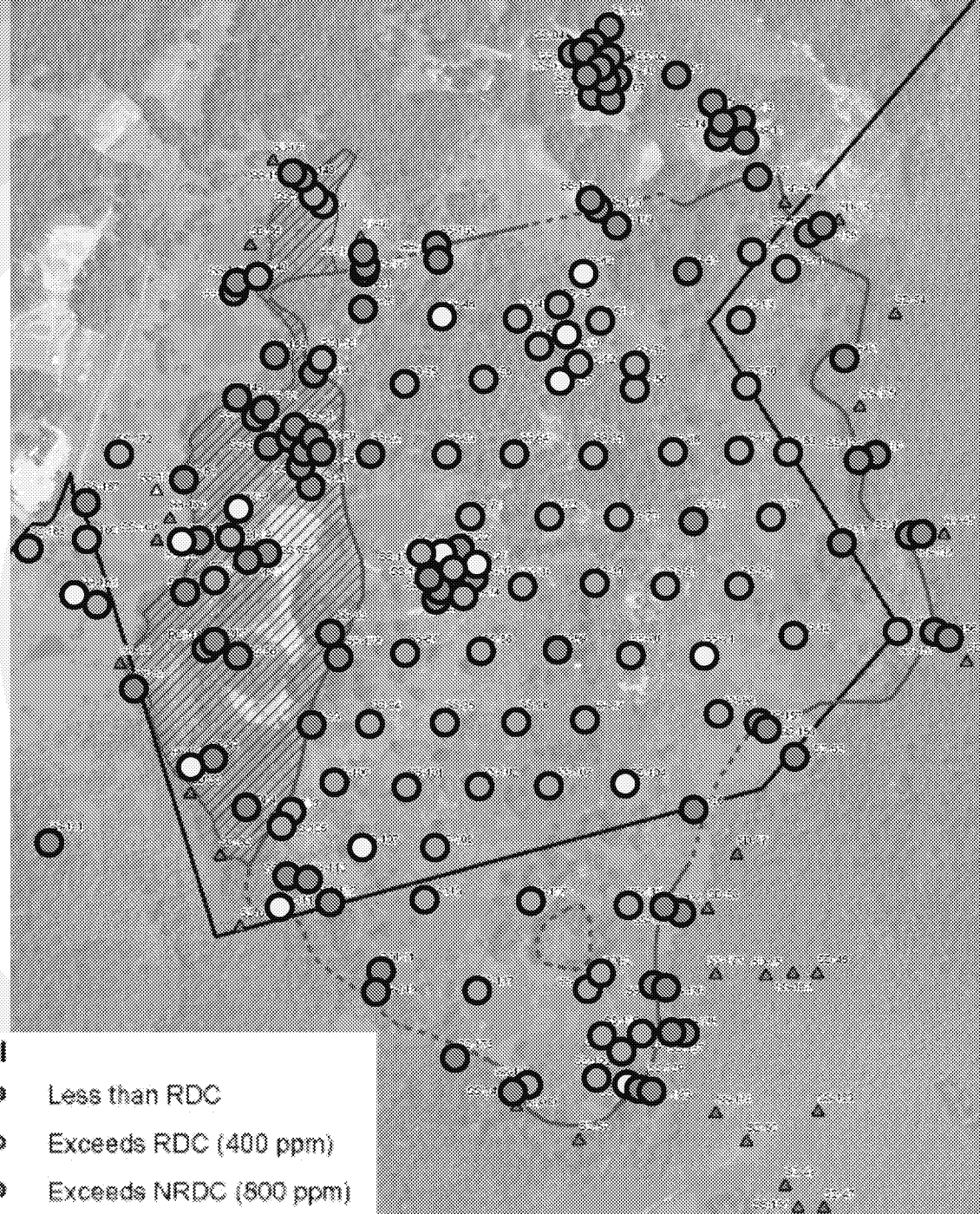
- Observations of active releases of leachate throughout the periphery of landfill and other areas
- Preliminary data suggest widespread contamination of constituents typically not associated with household waste (e.g., PCBs, lead, and mercury)
- Similar findings during the remedial investigation



Distribution of total PCB's as found during the remedial investigation



Distribution of lead as found during the remedial investigation



Introduction to Food Chain Risk Modeling

Food Chain Exposure Model for the American Robin

Contaminant	Soil			BAF	Invertebrates				AUF or SUF	Body Weight kg	Dose mg/kg/day	LOAEL		NOAEL	
	Concentration mg/kg	Ingestion Rate ¹ kg/day	Total Ingested Contaminant mg/day		Concentration mg/kg	Percent of Diet	Ingestion Rate ² kg/day	Total Ingested Contaminant mg/day				Value mg/kg/day	Hazard Quotient	Value mg/kg/day	Hazard Quotient
Lead	2700	0.007	18.90	0.45	1215.0	100%	0.069	83.84	1	0.077	1334.2	11.3	118.1	1.1	1180.7
Total PCBs	5	0.007	0.04	0.2	1.0	100%	0.069	0.07	1	0.077	1.4	1.8	0.8	0.18	7.5

Food Chain Exposure Model for the Short-tailed Shrew

Contaminant	Soil			BAF	Invertebrates				AUF or SUF	Body Weight kg	Dose mg/kg/day	LOAEL		NOAEL	
	Concentration mg/kg	Ingestion Rate ³ kg/day	Total Ingested Contaminant mg/day		Concentration mg/kg	Percent of Diet	Ingestion Rate ⁴ kg/day	Total Ingested Contaminant mg/day				Value mg/kg/day	Hazard Quotient	Value mg/kg/day	Hazard Quotient
Lead	2700	0.0002	0.54	0.45	1215.0	100%	0.0084	10.21	1	0.015	716.4	176	4.1	17.60	40.7
Total PCBs	5	0.0002	0.00	0.2	1.0	100%	0.0084	0.01	1	0.015	0.6	0.67	0.9	0.067	9.4

Notes:

NOAEL = no observed adverse effect level

LOAEL = lowest observed adverse effect level

kg = kilogram

kg/day = kilogram per day

mg/kg/day = milligram per kilograms per day

1 Soil Ingestion Rate (0.007 kg/day) = ingestion rate (10.4% for woodcock) × food ingestion rate (0.069 kg/day)

2 Food Ingestion Rate (0.069 kg/day) = ingestion rate (0.89 g/g-day) × body weight (0.077 kg)

3 Soil Ingestion Rate (0.0002 kg/day) = ingestion rate (2.4% for meadow vole) × food ingestion rate (0.0084 kg/day)

4 Food Ingestion Rate (0.0084 kg/day) = ingestion rate (0.56 g/g-day) × body weight (0.015 kg)

Ecological Risk Assessment Food Chain Model Summary

BERA Food Chain Model Results with NOAEL and LOAEL-based HQs over 1.0

COC	Meadow Vole		Short-tailed Shrew		American Robin		Red Fox		Little Brown Bat		Mink	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Total PCBs			3.3	1.7	4.1							
PCB TEQs			28	4.6	37	3.7	3.5					
Aroclor 1254			2.3	1.2	3.3						1.1	
Aroclor 1260					1.1							
PCDD/F TEQs	14	2.2	8.6	1.4	30	3	1.2					
Total PAHs			2.2		14	1.4						
benzo(a)anthracene					6.9							
benzo(a)pyrene					5.9							
bis(2-ethylhexyl) phthalate					1.5							
cyanide					110	11						
Arsenic			1.8		2.4	2			2			
Antimony			3.5	1.3			1.6				1.8	
Barium					18	9			1.9			
Cadmium	1.2		19	2.8	25	8.5						
Chromium	3.8		77	13	3.1	1.5						
Cobalt					1.8							
Copper			3.4	1.6	26	15			2.5	1.1	5.4	2.8
Lead			16	4.4	99	19						
Manganese			6.7	3.8	2.6	1.7						
Methyl mercury	29	5.7	24	4.8	26	20	1.5		3.4			
Nickel			6.1	2	4.9	3.3						
Selenium	4.2	1.9	15	6.9	23	10	3.6	1.8	18	8	2.2	1.1
Vanadium			19	9.5	28	14	1.3		1.4		1.2	
Zinc	1.4				25	15			5			

Results

Slight risk to herbivorous mammals

Risk to vermivorous mammals

Risk to vermivorous birds

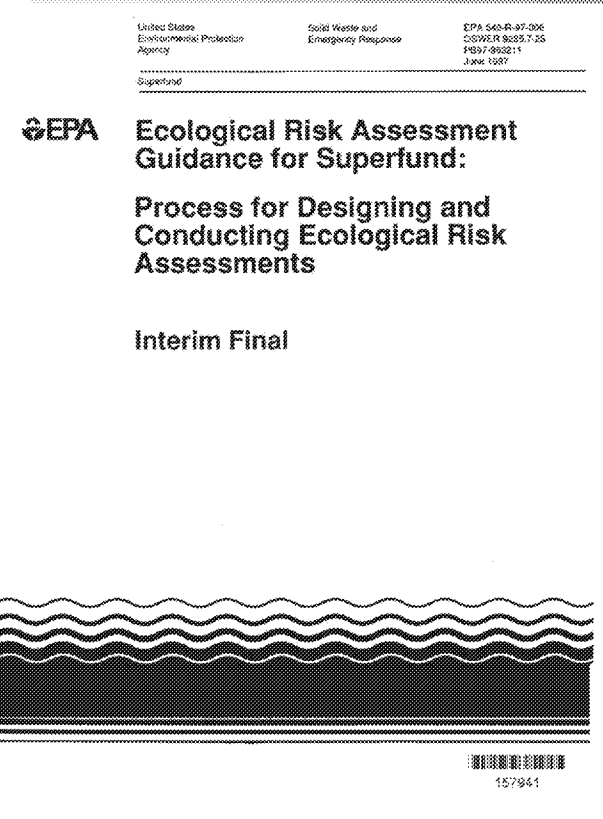
No unacceptable risk to carnivorous mammals

Slight risk to insectivorous mammals

Slight risk to piscivorous mammals

Ecological Risk Management

- “The risk manager considers inputs from the risk assessors, BTAGs, **stakeholders, and other involved parties.**”
- “Risk-management decisions are the responsibility of the risk manager (the site manager), not the risk assessor.”
- “Additional factors that the site risk manager takes into consideration include... **local, regional, and national ecological significance** of the site.”



Anticipated Remedial Alternative and Exposure Pathways

- It's been stated on several occasions that the remedy selected will be protective
- With exception of FS Alternative 5, the range of remedies discussed thus far allow for complete exposure pathways from site media contaminated by lead, mercury, PCBs and other contaminants to ecological receptors
- Of the five remedial alternatives discussed to date, only Alternative 5 which includes a full cap over contaminated material present in the landfilled area of the site will ensure an acceptable level of protectiveness

HIGHLIGHT 1-3 Exposure Pathway and Exposure Route

Exposure Pathway: The pathway by which a contaminant travels from a source (e.g., drums, contaminated soils) to receptors. A pathway can involve multiple media (e.g., soil runoff to surface waters and sedimentation, or volatilization to the atmosphere).

Exposure Route: A point of contact/entry of a contaminant from the environment into an organism (e.g., inhalation, ingestion, dermal absorption).

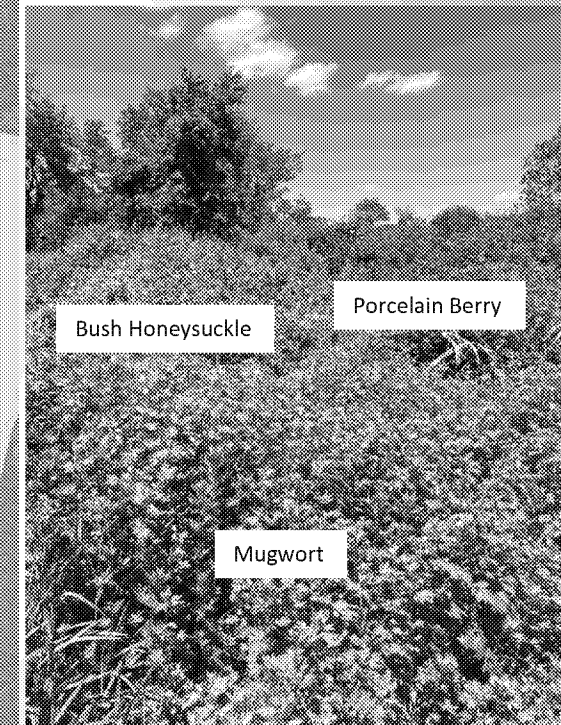
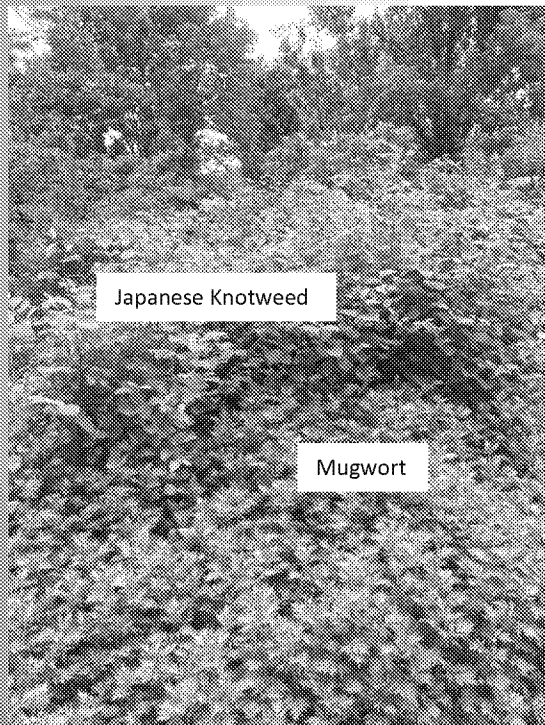
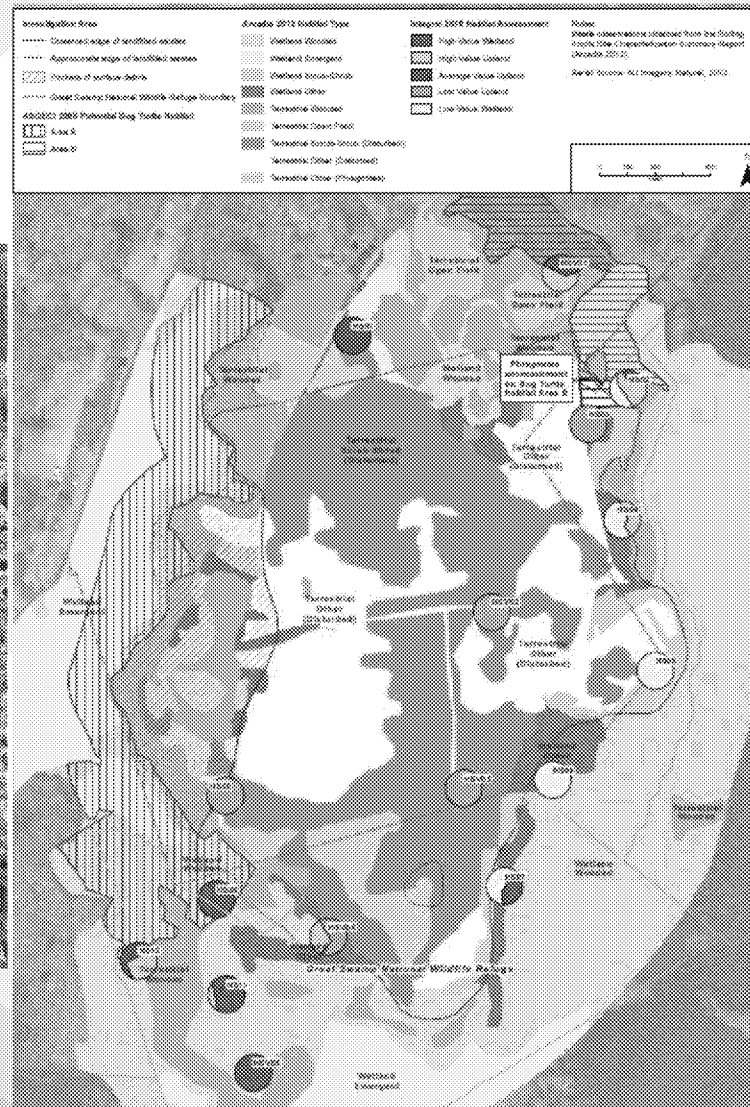
-USEPA 1997

Human Health Risks

- Site-specific human health risks – trespasser scenario only assuming Miele Trust continues to prohibit public access after cleanup
- Refuge Wilderness open to public use – trespasser assumptions don't really capture Wilderness paradigm
- Risk assessment overestimates the inaccessibility to the landfill from the Wilderness trail system by recreational users



Wildlife Habitat Quality



NJ Landfill Closure Requirements

.....For these reasons, NJDEP believes that both LLL [Legacy Landfill Law] and SWMA [Solid Waste Management Act] requirements are applicable as ARARs at the Site.

Therefore, the Solid Waste Regulations at N.J.A.C. 7:26, which require a final cover system over a landfill, are applicable to the Rolling Knolls Landfill Site. The final cover shall consist of at least a 2-foot thick clean soil cap that is properly graded to address surface drainage.....

August 19, 2020 letter from NJDEP to USEPA

CERCLA Municipal Landfills: Capping as a presumptive remedy

- By nature, treatment of waste in municipal landfills may be impracticable due to size and heterogeneity of material
- CERCLA landfills typically characterized by a mix of hazardous and non-hazardous waste
- EPA and NJDEP consider containment as an appropriate remedy to address source areas on municipal landfills.

"Section 300.430(a)(iii)(B) of the NCP contains the expectation that engineering controls, such as containment, will be used for waste that poses a relatively low long-term threat where treatment is impracticable. The preamble to the NCP identifies municipal landfills as a type of site where treatment of the waste may be impracticable because of the size and heterogeneity of the contents. Waste in CERCLA landfills usually is present in large volumes and is a heterogeneous mixture of municipal waste frequently co-disposed with industrial and/or hazardous waste. Because treatment usually is impracticable, EPA generally considers containment to be the appropriate response action, or the "presumptive remedy," for the source areas of municipal landfill sites."

-USEPA 1993

FWS Recommended Alternative

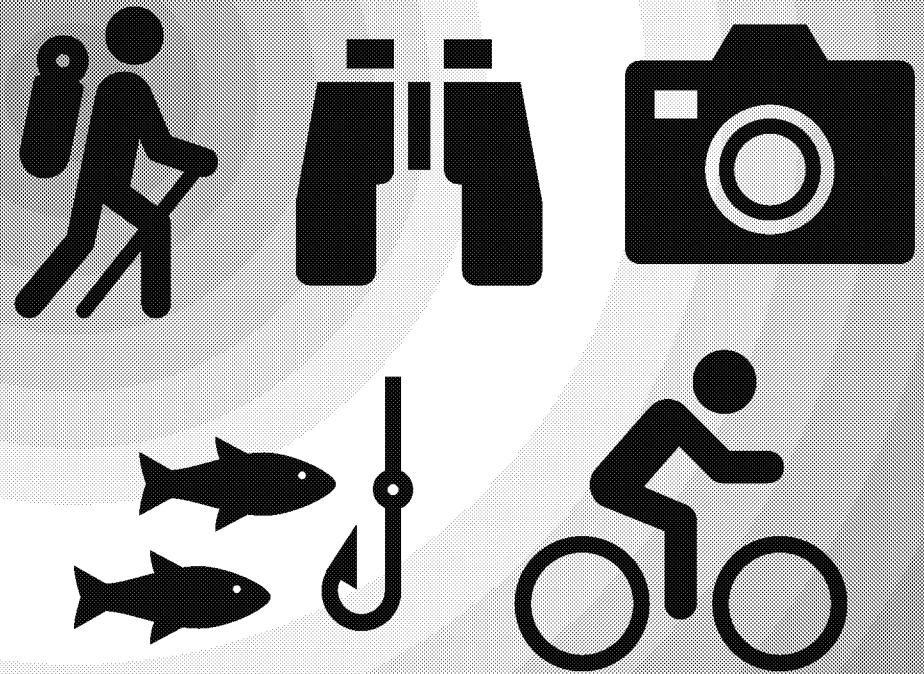


Benefits of FWS' Recommended Alternative

- Consolidation, compaction, and capping and grading of all contaminated material
- Use of onsite clay and soils in landfill cap construction
 - Readily available
 - Low moisture content requiring minimal, if any dewatering
 - Good plasticity; i.e., is “workable”
 - Use of natural clays is a proven technology used in the prevention and attenuation of landfill leachate
 - Minimizes disturbance to the community
- Elimination of exposure pathways for human and wildlife
- Habitat improvement / control of invasive species
- Create something useable and beneficial for the public and environment

Current and Future Public Use

- Wilderness Area is currently open for public recreation
- Many partners share interest in the landfill remediation being value added for the community
 - Passive Recreation
 - Photography
 - Bird watching
 - Hiking
 - Active Recreation
 - Fishing
 - Hunting
 - Biking



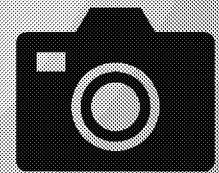
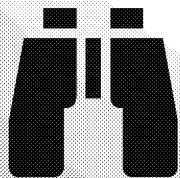
Current and Future Public Use *Opportunities*

a. The Subject Property shall be preserved as open space. There shall be no development of the Subject Property for any purposes, including, without limitation, for residential, commercial, or industrial use.

What is Open Space?

Open space is any open piece of land that is undeveloped (has no buildings or other built structures) and is accessible to the public.

(USEPA)



Questions?

